CHARUSAT
CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

CE263: Database Management System

Introductory concepts of DBMS

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Outline

- 1.1　Introduction and applications of DBMS

- 1.2　Purpose of database

- 1.3　Data Independence

- 1.4　Database System architecture- levels

- 1.5　Mappings

- 1.6　Database users and DBA

Introduction

- Data: Raw and isolated facts about entity (recorded)

Ex. Text, audio, video, image, map etc.

- Information : Processed , meaning full, Useable data,

- Data base: Collection of similar/ related data.

- DBMS: Software used to create, manipulate and delete data.

Database Management System (DBMS)

- DBMS contains information about a particular enterprise
  - Collection of interrelated data
  - Set of programs to access the data
  - An environment that is both *convenient* and *efficient* to use
- Database Applications:
  - Banking: transactions
  - Airlines: reservations, schedules
  - Universities: registration, grades
  - Sales: customers, products, purchases
  - Online retailers: order tracking, customized recommendations
  - Manufacturing: production, inventory, orders, supply chain
  - Human resources: employee records, salaries, tax deductions
- Databases can be very large.
- Databases touch all aspects of our lives

University Database Example

- Application program examples

  - Add new students, instructors, and courses

  - Register students for courses, and generate class rosters

  - Assign grades to students, compute grade point averages (GPA) and generate transcripts

- In the early days, database applications were built directly on top of file systems

Drawbacks of using file systems to store data

- Data redundancy and inconsistency
  - Multiple file formats, duplication of information in different files
- Difficulty in accessing data
  - Need to write a new program to carry out each new task
- Data isolation
  - ensures that several transactions can take place simultaneously and that no data from one database should have an impact on another.
- Integrity problems
  - Integrity constraints (e.g., account balance > 0) become "buried" in program code rather than being stated explicitly
  - Hard to add new constraints or change existing ones

Drawbacks of using file systems to store data (Cont.)

- Atomicity of updates
    - Failures may leave database in an inconsistent state with partial updates carried out
    - Example: Transfer of funds from one account to another should either complete or not happen at all
- Concurrent access by multiple users
    - Concurrent access needed for performance
    - Uncontrolled concurrent accesses can lead to inconsistencies
        4 Example: Two people reading a balance (say 100) and updating it by withdrawing money (say 50 each) at the same time
- Security problems
    - Hard to provide user access to some, but not all, data

Database systems offer solutions to all the above problems

Levels of Abstraction

- **Physical level:** describes how a record (e.g., instructor) is stored.

- **Logical level:** describes data stored in database, and the relationships among the data.

  type *instructor* = **record**

     ID : string;
     name : string;
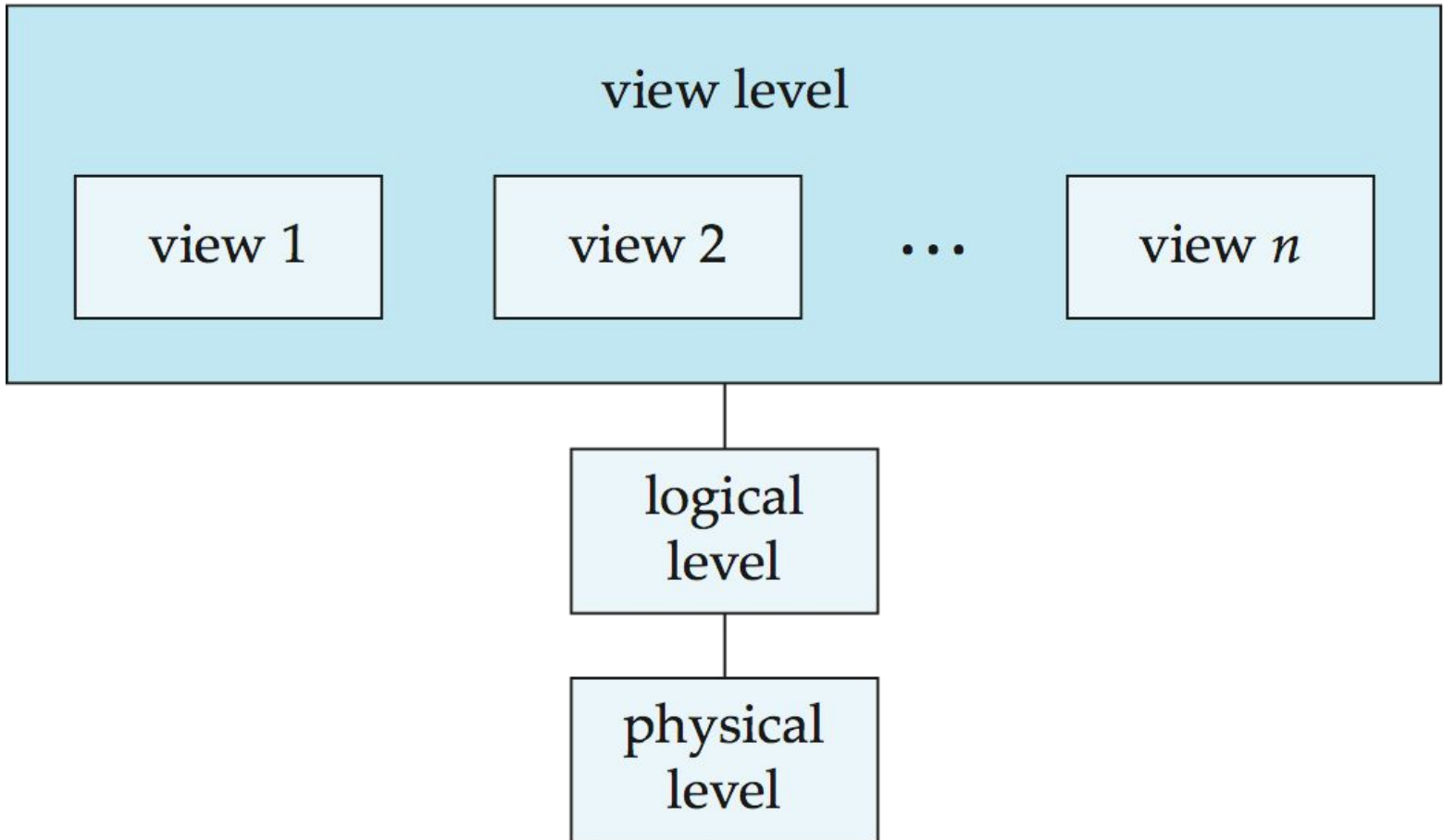   *dept_name* : string;
     salary : integer;

       end;

- **View level:** application programs hide details of data types. Views can also hide information (such as an employee's salary) for security purposes.

View of Data

An architecture for a database system

Instances and Schemas

- Instances and Schemas: A collection of information which is stored in the DB.

- DB change over a time as information is inserted and deleted.

- Collection of information store in the database at a particular moment is known as instances of DB.

- Overall design is known as DB Schema.

Instances and Schemas

- Similar to types and variables in programming languages
- **Physical schema**– the overall physical structure of the database , Physical schema is like the physical structure of human body.
- **Logical Schema** – the overall logical structure of the database
  - Example: The database consists of information about a set of customers and accounts in a bank and the relationship between them
    - 4 A logical schema is just like the internal workings of the human body.
- **Instance** – the actual content of the database at a particular point in time
- **Physical Data Independence** – the ability to modify the physical schema without changing the logical schema
  - Applications depend on the logical schema
  - In general, the interfaces between the various levels and components should be well defined so that changes in some parts do not seriously influence others.

Types of Data Base

1) Classification Based on the number of user
   - Single user
   - Multiple user DB

2) Classification Based on location
   - Centralized DB
   - Distributed DB

3) Degree to which Data are structured
   - Unstructured data
   - Semi-structure Data
   - Structure Data

DB System User

- **Naive user :** don't have any knowledge of DBMS but still frequently use the database applications to get the desired results.
- **Sophisticated User :** access the database and retrieve the data from the database using applications and interfaces provided by the Database Management System (DBMS).
- **System Analyst :** their responsibility to check whether all the requirements of end users are satisfied or not.
- **Application Programmer :** computer professional users who are responsible for developing the application programs or the user interface so that other users can use these applications to interact with the database.
- **DBA :** an individual or a team of users who define the database schema and takes charge of controlling various levels of the database within the organization.
- **Database Designers :** design and create the structure of the database, try to gather information depending upon the requirements related to the database like the layout, looks, database functioning, costing, technologies to be used & implementation techniques, and finally, they design the final layout of the database for programmers to code its logic.
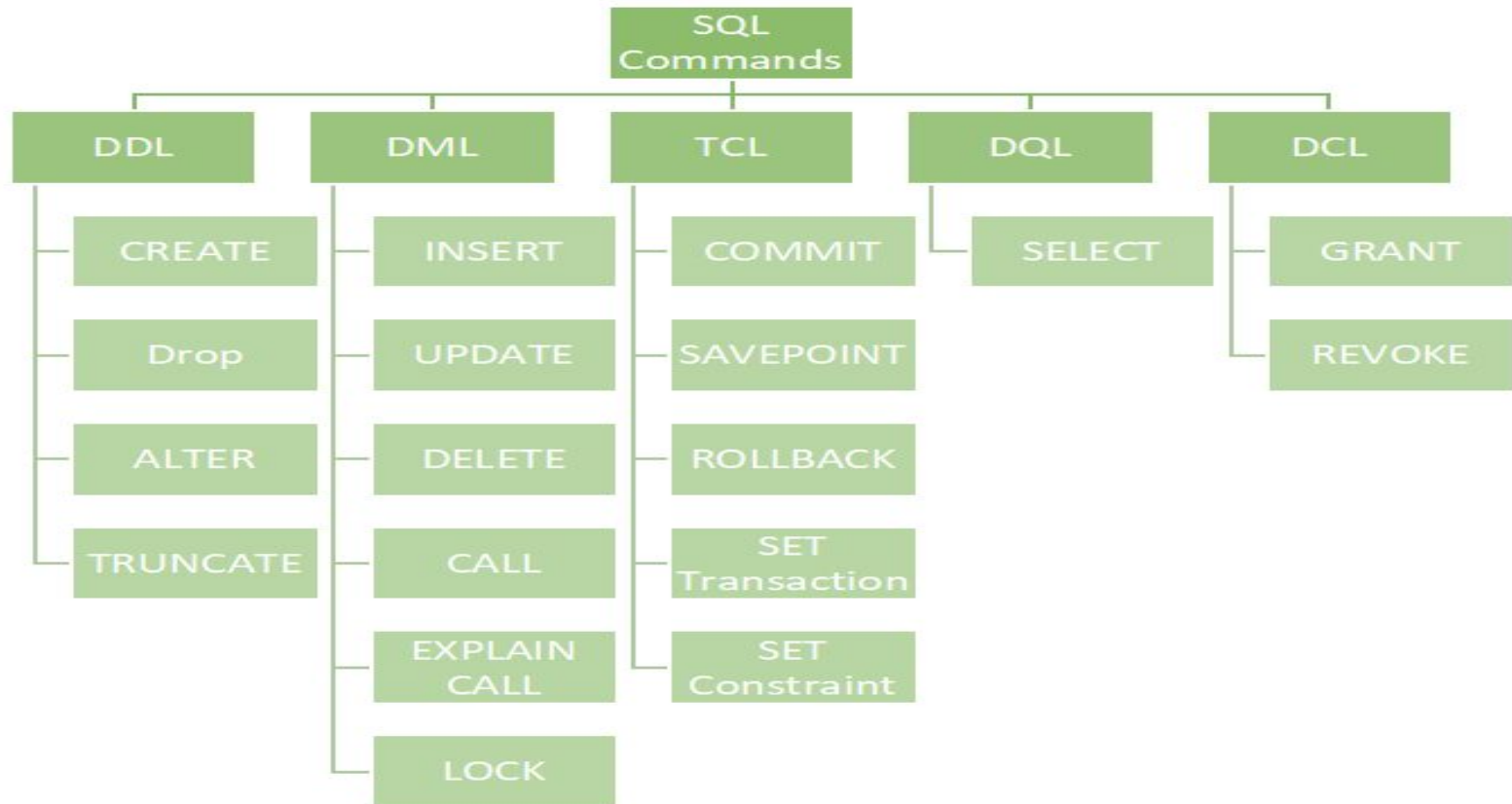
Database Administrator

- A person who has such central control over the system is called a database administrator (DBA).
- The functions of a DBA include:
  - **Schema definition:** The DBA creates the original database schema

  - **Storage structure and access-method definition.**

  - **Schema and physical-organization modification:** The DBA carries out changes to the schema and physical organization to reflect the changing needs of the organization, or to alter the physical organization to improve performance.

  - **Granting of authorization for data access**.

  - **Routine maintenance :** Periodically backing up the database, Ensuring that enough free disk space is available, Monitoring jobs running on the database and ensuring that performance is not degraded

SQL commands are mainly categorized into five categories:

1. DDL – Data Definition Language
2. DQL – Data Query Language
3. DML – Data Manipulation Language
4. DCL – Data Control Language
5. TCL – Transaction Control Language

End of Chapter 1